

The Connection Between Surface-Water Quality and Ground-Water Quality in a Karst Aquifer

The Upper Floridan aquifer, which is the sole source of water supply for Valdosta, Georgia, and much of the surrounding area, receives large volumes of direct discharge from the Withlacoochee River through sinkholes in the streambed or off-channel. A highly interconnected conduit system has developed in the Upper Floridan aquifer in this area, which extends at least 15 miles from the sinkhole area. Chloride and isotopic data were used by Plummer and others (1998) to map the percentage of Withlacoochee River water in ground water in the Upper Floridan aquifer (Figure E-1). These data indicate that ground water in parts of the Upper Floridan aquifer contains high percentages of recently recharged Withlacoochee River water. Plummer and others (1998) note that, although the patterns shown in Figure E-1 are generally true over the area, extreme variations can occur at a given location, as would be expected because of the large variations and discontinuities in hydraulic properties in the karst environment and time-varying inflows of river water into the aquifer.



Sinkhole near the Withlacoochee River.
(Photograph by Richard E. Krause,
U.S. Geological Survey.)

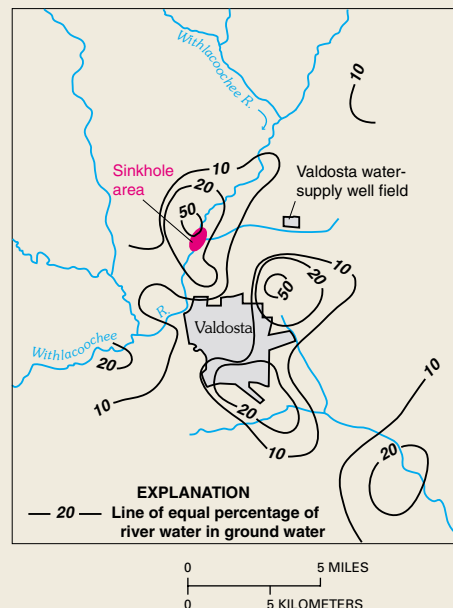


Figure E-1. Estimated percentage of Withlacoochee River water in ground water in the Upper Floridan aquifer, June 1991. (Modified from Plummer and others, 1998.)

The strong connection between the Withlacoochee River and ground water in the Valdosta area has created concerns about the potential for contamination of ground-water supplies by contaminants in the river. There also are concerns about the effects of natural organic matter in the river water. For example, in the early 1980's, it was recognized that chlorination of aquifer water produced disinfection by-products in excess of drinking-water standards. This occurred as a result of reaction of chlorine with the high amounts of natural organic matter in the river water recharged to the aquifer.

The original wells for Valdosta were near the city, in the areas where the aquifer contains a high percentage of river water. The city completed a new set of water-supply wells in the well field indicated in Figure E-1, in an area where the aquifer contains a relatively low percentage of river water. Even with this added level of assurance, it is still necessary to protect the surface waters that supply the aquifer. The source area of concern for ground water is the entire Withlacoochee River Basin upstream from Valdosta.